

CLAIMS

1. An inorganic-organic hybrid film-coated stainless steel foil comprising a stainless steel foil substrate having coated on one surface or both surfaces thereof an inorganic-organic hybrid film, wherein said inorganic-organic hybrid film comprises a skeleton formed of an inorganic three-dimensional network structure mainly comprising a siloxane bond, with at least one crosslinked oxygen of said skeleton being replaced by an organic group and/or a hydrogen atom, and the ratio [H]/[Si] between hydrogen concentration [H] (mol/l) and silicon concentration [Si] (mol/l) in said film satisfies the condition of  $0.1 \leq [H]/[Si] \leq 10$ .

2. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 1, wherein said organic group is one or more member selected from an alkyl group, an aryl group, a hydroxyl group, a carboxyl group and an amino group.

3. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 1 or 2, wherein the average roughness  $R_{af}$  of the surface of said inorganic-organic hybrid film satisfies the condition of  $R_{af} \leq 0.02 \mu\text{m}$ .

4. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 1 to 3, wherein the thickness  $T_f$  of said inorganic-organic hybrid film satisfies the condition of  $0.05 \mu\text{m} \leq T_f \leq 5 \mu\text{m}$ .

5. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 1 to 4, wherein the thickness  $T_f$  of said inorganic-organic hybrid film and the thickness  $T_s$  of said stainless steel foil substrate satisfy the condition of  $T_f \leq T_s/20$ .

6. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 1 to 5, wherein the thickness  $T_f$  of said inorganic-organic hybrid film and the average roughness  $R_{as}$  of the surface

of said stainless steel foil substrate satisfy the condition of  $R_{as} \leq T_f/2$ .

5        7. An inorganic-organic hybrid film-coated stainless steel foil comprising a stainless steel foil having coated thereon a plurality of inorganic-organic hybrid films each mainly comprising a siloxane bond, wherein at least a part of Si constituting each inorganic-organic hybrid film is chemically bonded to one or both of an organic group and hydrogen, provided that  
10       the uppermost layer out of said plurality of inorganic-organic hybrid films may be an inorganic  $\text{SiO}_2$  film, and adjacent films of said plurality of inorganic-organic hybrid films (including the inorganic  $\text{SiO}_2$  film) differ in the composition from each other.

15       8. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 7, wherein out of said plurality of inorganic-organic hybrid films, the thermal expansion coefficient of the upper inorganic-organic hybrid film is smaller than the thermal expansion  
20       coefficient of the lower inorganic-organic hybrid film.

9. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 7 or 8, wherein the uppermost film is an  $\text{SiO}_2$  film.

25       10. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 7 or 8, wherein the uppermost inorganic-organic hybrid film is an inorganic-organic hybrid film in which at least a part of the Si constituting the film is bonded to hydrogen but is not bonded to an organic group.

30       11. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 10, wherein the molar ratio of H/Si in said uppermost inorganic-organic hybrid film is 1.0 or less.

35       12. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 11, wherein said uppermost inorganic-organic hybrid film has a thickness of 0.5  $\mu\text{m}$  or less.

13. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 12, wherein out of said plurality of inorganic-organic hybrid films, the lowermost inorganic-organic hybrid film  
5 is an inorganic-organic hybrid film in which at least a part of Si constituting the film is bonded to an alkyl group having a carbon number of 1 to 4.

14. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 13, wherein said  
10 alkyl group is a methyl group.

15. The inorganic-organic hybrid film-coated stainless steel foil as claimed in claim 14, wherein the molar ratio of methyl group/Si in said lowermost inorganic-organic hybrid film is from 0.2 to 1.0.

15 16. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 15, wherein said lowermost inorganic-organic hybrid film has a thickness of 0.5 to 5  $\mu\text{m}$ .

20 17. The inorganic-organic hybrid film-coated stainless steel foil as claimed in any one of claims 7 to 16, which further comprises an inorganic-organic hybrid film having a medium thermal expansion coefficient between the uppermost inorganic-organic hybrid film having a small thermal expansion coefficient and the  
25 lowermost inorganic-organic hybrid film having a large thermal expansion coefficient.